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LONG VERSUS SHORT PROXIMAL FEMORAL NAIL IN THE MANAGEMENT OF UNSTABLE INTERTROCHANTERIC FRACTURES IN ELDERLY POPULATION

Orthopaedics

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ABSTRACT

INTRODUCTION: Intertrochanteric fractures constitute a vast majority of geriatric orthopedic trauma having highest postoperative morbidity and mortality of surgically treated fractures. Use of cephalomedullary nails for treatment of highly unstable intertrochanteric fractures is now more common as plate fixation is associated with higher risk of implant breakage and screw cutout. However, choice of length of these nails remains surgeon dependent.

AIM: to compare the functional outcome and complications associated with the use of Long and Short PFN for the treatment of unstable intertrochanteric fractures (AO/OTA type 31A1 and 31A2) in elderly population.

METHOD: A prospective interventional study comprising of 58 patients distributed in two groups in which one group (n=25) was treated with long PFN while other group (n=33) was operated with short PFN. Parameters compared between these two groups included demographic data, intraoperative blood loss and surgical duration as well as analysis of radiological and clinical progression of union and postoperative complications in the form of hip pain, anterior thigh pain and failure rate. Functional assessment was done using Harris hip score.

RESULT: This study included only AO/OTA type 31A1 and 31A2 fracture types in elderly patients above 60 years of age. We found no statistically significant difference with regard to age, sex as well as fracture type among two groups. Long PFN group had a shorter union time (11.4 weeks) and was associated with lesser postoperative complication and failure rate as compared to short PFN. Also, functional outcome evaluated using Harris hip score shown better scores in long PFN group. However, intraoperative blood loss and surgical duration was found to be significantly lesser in short PFN group.

CONCLUSION: use of cephalomedullary nails either short or long for fixation of unstable intertrochanteric fractures particularly AO/OTA type 31A1 and 31A2 provides good results. However, longer nails should be preferred over short nails as these are associated with less postoperative complication such as hip pain or anterior thigh pain owing to excessive curvature of femur in Indian population with lesser union time and better functional outcome as compared to short PFN. Shorter nails may be used in cases of sick and polytrauma patients where shorter operative time with minimal blood loss is desirable

KEYWORDS

unstable intertrochanteric fracture, short PFN, long PFN

INTRODUCTION

Fracture of the intertrochanteric region of the femur commonly occur in older age group and are mostly associated with low energy trauma. They constitute a vast majority of orthopedic trauma and remain the most frequently operated fracture type with highest postoperative fatality of surgically treated fractures [1]. High cost of treatment and care associated with these fractures make them a serious health resource issue, particularly in Asia where it is estimated to constitute almost half of the global burden by 2050 [2,3]. Hence, paradigm of treatment of these fractures should be attainment of optimal functional recovery as well as prevention of future hip fractures [4]. Plate fixation of unstable fractures with either a fixed angle device or sliding hip screw has a higher risk of implant breakage and screw back out [5]. Cephalomedullary nails are now more commonly used for unstable intertrochanteric fractures. However, choice of length of these nails remains surgeon dependent. Considering the excessive curvature of femur in Asian population, use of long Proximal femoral nail (PFN) has been linked to reports of anterior cortical perforation along with other disadvantages like excessive operative time and need for excessive reaming as compared to Short PFN [10]. However, longer nails are claimed to provide better stability. Hence, aim of the current study was to compare the functional outcome and complications associated with the use of Long and Short PFN for the treatment of unstable intertrochanteric fractures in elderly population.

METHOD

This is a prospective, randomized study carried out at Rajendra Institute of Medical Sciences, Ranchi between December 2019 to March 2021 after getting clearance from the Ethics committee. It included 58 patients of unstable intertrochanteric fracture who met the inclusion and exclusion criteria. Patients were randomized into two groups in which one group (n=25) was treated with long PFN and other (n=33) with short PFN. A written informed consent was taken from all patients undergoing the study.

INCLUSION CRITERIA: (1) Patients above the age of 60 years (2) Unstable fractures with AO/OTA 31A1 and 31A2 (3) Patients medically fit for surgery

EXCLUSION CRITERIA: (1) Sub trochanteric fractures (2) Pathological fractures (3) Multiple fractures or polytrauma patients (4) Isolated greater or lesser trochanter fractures (5) AO/OTA Type 31A3

Upon arrival of the patients in OPD or Emergency, a careful history was elicited from the patient and/or attendants to reveal the mechanism of injury and severity of trauma. Clinical Assessment of general medical condition was then done along with examination of local injury. Radiographic study involved anteroposterior view of pelvis including both hips and lateral view of the involved hip including thigh. Fractures were classified as per AO/OTA classification as we included only type 31A1 and 31A2 in our study. Routine preoperative investigation was then carried out and associated medical comorbidities were optimized before undertaking the surgery. Meanwhile, all the patients were immobilized by applying upper tibial skeletal traction. Antibiotic prophylaxis was started one day prior to day of operation. Most of the patients were operated within 10 days of admission.

Surgical Technique: All the cases were operated with the patient positioned supine over a fracture table under image intensifier guidance. Closed reduction was attempted with longitudinal traction and internal rotation supplemented with percutaneous reduction techniques using Steinmann pin or bone lever as required. A modified medial trochanteric portal was used with entry portal made centrally in both AP and lateral views. Reaming was performed in all cases. Distal locking was done through free hand technique for long nails while an aiming device was used in case of short PFN. Surgical duration and blood loss was recorded in every cases.

Postoperatively, joint mobilization exercises were started on next day along with quadriceps strengthening exercises and patients were encouraged to sit up in the bed to minimize the risk of DVT and pressure sores. Patients were made to ambulate non-weight bearing with axillary crutches.

All the patients were followed up at 2 weeks, 6 weeks, 3 months, 6 months postoperatively and further if required for some patients and assessed clinically and radiographically. Patients were looked for complaints of hip pain if any, shortening of limb, failure of fixation or

implant failure or periprosthetic fracture and signs of radiological union. Failure was defined as occurrence of periprosthetic fracture or reoperation requiring revision or removal of nail. Functional assessment was done using Modified Harris hip score. Statistical analysis of data was assessed with the help of Fisher test, student t test and chi-square test. P value of <0.05 was considered statistically significant.

RESULT

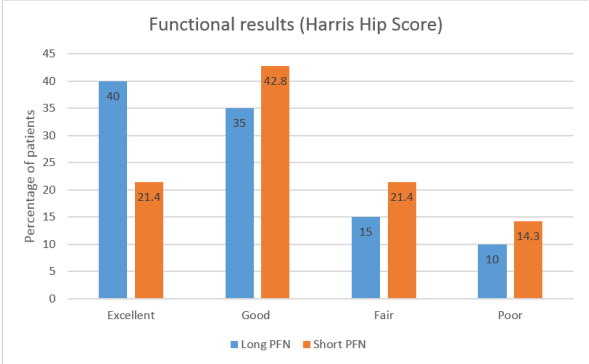
We included a total of 58 patients for this study of which 25 patients were operated with long PFN and 33 patients with short PFN.

Table/ Fig-1: Relevant Patient related, Intraoperative, Functional result and Complication related variables between the two groups

Parameter	Long PFN	Short PFN
Sample size (n)	25	33
Mean age (year)	66	68
Gender (M/F)	15/10	20/13
Type of fracture (31A1/31A2)	16/9	18/15
Duration of surgery (minute)	95	65
Blood loss (ml)	320	110
Mean union time (week)	11.4	13.6
Hip pain	15%	28.5%
Anterior thigh pain	15.1%	32.1%
Failure rate (%)	none	7.14%

Mean age of patients in the long PFN group was 66 years (range 61-76 years) while in the short PFN group, it was 68 years (range 60-84 years). Male predominance was seen in both groups with 66.6% males in Long PFN group and 60.7% males in short PFN group. Trivial trauma due to simple fall over ground was found to be the most common mode of injury as it was seen in 49 out of 58 patients amounting to 84%. This study included only AO/OTA type 31A1 and 31A2 fracture types and we found type 31A1 to be commoner fracture pattern (58.3%) as compared to 31A2. There was no statistically significant difference with regard to age, sex as well as fracture type among two groups.

Mean intraoperative blood loss in long PFN group was 320 ml while in short PFN, it was 110 ml which is statistically significant. This was due to more reaming and opening of medullary canal in case of long nails. Average duration of surgery for long PFN was 95 minutes whereas for short PFN group, it was significantly lesser i.e. 65 minutes. Longer operative time in long PFN group may be attributed to more requirement of reaming and free hand distal locking using perfect circle technique which is not needed in case of short nails as custom jigs were used which doesn't require fluoroscopy for distal locking. This difference in surgical time can prove critical in case of sick or polytrauma patients where shorter operative time is preferable.



Table/Fig-2: functional results of Long and Short PFN using Harris Hip Score

Mean time of union in long PFN group was 11 .4 weeks while in short PFN group, it was 13.6 weeks. In the study conducted by Harrington KD et al, radiological time of union was 16 weeks whereas Rao JP et al and B Mall et al found time of union to be 18 weeks and 14 weeks respectively [7,8,9].

Incidence of hip pain was seen in 28.5% patients in the short PFN group while in only 15% patients in long PFN group. There were two cases of implant failure (7.14%) seen in short PFN group while none in case of long PFN. Considering these two parameters i.e. hip pain and failure rate, long PFN definitely appears to have an advantage over short nails. Similar inference was also drawn by Shyamkumar C et al. however, study by Hou Z et al found no difference between long and short cephalomedullary nails used for intertrochanteric fractures and attributed this to advancement in implant biomaterial and more anatomic fits of long nails to geriatric femur as well as length modification of shorter nails with incorporation of tapered end and smaller locking screws [11]. Lei Sheng Jiang et al found no any incidence of complications such as cutout or breakage of implants or peri-implant fracture and recommended to place neck screw in inferior portion of femoral neck close to calcar reaching 5 to 10 mm below the articular cartilage subchondral in anteroposterior view [12].

Table/Fig-3: Postoperative radiograph Long PFN

Table/Fig-4: Postoperative radiograph Short PFN

Incidence of Anterior thigh pain was seen more common with the use of short PFN (32.1%) as compared to long nails (15%) especially while using short nails of length 240mm. this appears to be due to excessive bowing of femur as well as shorter femur length in Indian population with nail tip impinging anterior cortex of the femur. Hwang et al in their study on Chinese population also 0bserved the same phenomenon and advocated using either longer nails for Asian population to bypass the excessive femoral curvature or relatively shorter nails to prevent this complication [14].

No any incidence of infection was seen in either of the groups. We routinely use two doses of cephalosporin antibiotic preoperatively in all cases of hip fractures as recommended by Bodoky et al and we found excellent results in our study with this regimen with regard to infection [16].

Functional assessment was done using modified Harris hip score (HHS) which depicted more number of patients with excellent score in long PFN group (40%) as compared to short PFN group (21.4%) at 6 months follow up period. However, in their study conducted by Zhi L et al, no statistically significant difference was found in HHS in both groups at 1 year follow up [13].

Relatively smaller sample size and shorter duration of follow up remains a major limitation of this study and we feel that a larger study with longer duration of follow up are required for firmer validation of results.

CONCLUSION

Based on the results of our current study, we conclude that use of cephalomedullary nails either short or long for fixation of unstable intertrochanteric fractures particularly AO/OTA type 31A1 and 31A2 provides good results as it has principles and advantages of all the intramedullary devices with shorter moment arm and provides more rotational stability of proximal fragment. However, longer nails should be preferred over short nails as these are associated with less postoperative complication such as hip pain or anterior thigh pain owing to excessive curvature of femur in Indian population with lesser union time and better functional outcome as compared to short PFN. Shorter nails may be used in cases of sick and polytrauma patients where shorter operative time with minimal blood loss is desirable. Proper patient selection with good preoperative planning and perioperative acceptable reduction remains the key to minimize complication along with obtaining good functional results.

Conflicts of interest: the authors declare that there are no conflicts of interest.

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